

SEQUENCE LISTING

<110> YOKOYAMA, KEIICHI
NAKAMURA, NAMI
MIWA, TETSUYA
SEGURO, KATSUYA

<120> PROCESS FOR PRODUCING MICROBIAL TRANSGLUTAMINASE

<130> 0010-0937-0

<140> 09/109,063
<141> 1998-07-02

<150> JP 180010/1997
<151> 1997-07-04

<160> 62

<170> PatentIn Ver. 2.0

<210> 1
<211> 331
<212> PRT
<213> Artificial Sequence

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<223> Description of Artificial
Sequence:TRANSGLUTAMINASE

<400> 1
Asp Ser Asp Asp Arg Val Thr Pro Pro Ala Glu Pro Leu Asp Arg Met
1 5 10 15

Pro Asp Pro Tyr Arg Pro Ser Tyr Gly Arg Ala Glu Thr Val Val Asn
20 25 30

Asn Tyr Ile Arg Lys Trp Gln Gln Val Tyr Ser His Arg Asp Gly Arg
35 40 45

Lys Gln Gln Met Thr Glu Glu Gln Arg Glu Trp Leu Ser Tyr Gly Cys
50 55 60

Val Gly Val Thr Trp Val Asn Ser Gly Gln Tyr Pro Thr Asn Arg Leu
65 70 75 80

Ala Phe Ala Ser Phe Asp Glu Asp Arg Phe Lys Asn Glu Leu Lys Asn
85 90 95

Gly Arg Pro Arg Ser Gly Glu Thr Arg Ala Glu Phe Glu Gly Arg Val
100 105 110

Ala Lys Glu Ser Phe Asp Glu Glu Lys Gly Phe Gln Arg Ala Arg Glu
115 120 125

Val Ala Ser Val Met Asn Arg Ala Leu Glu Asn Ala His Asp Glu Ser
 130 135 140
 Ala Tyr Leu Asp Asn Leu Lys Lys Glu Leu Ala Asn Gly Asn Asp Ala
 145 150 155 160
 Leu Arg Asn Glu Asp Ala Arg Ser Pro Phe Tyr Ser Ala Leu Arg Asn
 165 170 175
 Thr Pro Ser Phe Lys Glu Arg Asn Gly Gly Asn His Asp Pro Ser Arg
 180 185 190
 Met Lys Ala Val Ile Tyr Ser Lys His Phe Trp Ser Gly Gln Asp Arg
 195 200 205
 Ser Ser Ser Ala Asp Lys Arg Lys Tyr Gly Asp Pro Asp Ala Phe Arg
 210 215 220
 Pro Ala Pro Gly Thr Gly Leu Val Asp Met Ser Arg Asp Arg Asn Ile
 225 230 235 240
 Pro Arg Ser Pro Thr Ser Pro Gly Glu Gly Phe Val Asn Phe Asp Tyr
 245 250 255
 Gly Trp Phe Gly Ala Gln Thr Glu Ala Asp Ala Asp Lys Thr Val Trp
 260 265 270
 Thr His Gly Asn His Tyr His Ala Pro Asn Gly Ser Leu Gly Ala Met
 275 280 285
 His Val Tyr Glu Ser Lys Phe Arg Asn Trp Ser Glu Gly Tyr Ser Asp
 290 295 300
 Phe Asp Arg Gly Ala Tyr Val Ile Thr Phe Ile Pro Lys Ser Trp Asn
 305 310 315 320
 Thr Ala Pro Asp Lys Val Lys Gln Gly Trp Pro
 325 330

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 Asp Ser Asp Asp Arg Val Thr Pro Pro Ala Glu Pro Leu Asp Arg Met

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cca gat cca tat cgt cca tct tat ggt cgt gct gaa act gtt gtt aat				96
Pro Asp Pro Tyr Arg Pro Ser Tyr Gly Arg Ala Glu Thr Val Val Asn				
20	25	30		
aat tat att cgt aaa tgg caa caa gtt tat tct cat cgt gat ggt cgt				144
Asn Tyr Ile Arg Lys Trp Gln Gln Val Tyr Ser His Arg Asp Gly Arg				
35	40	45		
aaa caa caa atg act gaa gaa caa cgt gaa tgg ctg tct tat ggt tgc				192
Lys Gln Gln Met Thr Glu Glu Gln Arg Glu Trp Leu Ser Tyr Gly Cys				
50	55	60		
gtt ggt gtt act tgg gtt aac tct ggt cag tat ccg act aac cgt ctg				240
Val Gly Val Thr Trp Val Asn Ser Gly Gln Tyr Pro Thr Asn Arg Leu				
65	70	75	80	
gca ttc gct tcc ttc gat gaa gat cgt ttc aag aac gaa ctg aag aac				288
Ala Phe Ala Ser Phe Asp Glu Asp Arg Phe Lys Asn Glu Leu Lys Asn				
85	90	95		
ggt cgt ccg cgt tct ggt gaa act cgt gct gaa ttc gaa ggt cgt gtt				336
Gly Arg Pro Arg Ser Gly Glu Thr Arg Ala Glu Phe Glu Gly Arg Val				
100	105	110		
gct aag gaa tcc ttc gat gaa gag aaa ggc ttc cag cgt gct cgt gaa				384
Ala Lys Glu Ser Phe Asp Glu Glu Lys Gly Phe Gln Arg Ala Arg Glu				
115	120	125		
gtt gct tct gtt atg aac cgt gct cta gag aac gct cat gat gaa tct				432
Val Ala Ser Val Met Asn Arg Ala Leu Glu Asn Ala His Asp Glu Ser				
130	135	140		
gct tac ctg gat aac ctg aag aag gaa ctg gct aac ggt aac gat gct				480
Ala Tyr Leu Asp Asn Leu Lys Glu Leu Ala Asn Gly Asn Asp Ala				
145	150	155	160	
ctg cgt aac gaa gat gct cgt tct ccg ttc tac tct gct ctg cgt aac				528
Leu Arg Asn Glu Asp Ala Arg Ser Pro Phe Tyr Ser Ala Leu Arg Asn				
165	170	175		
act ccg tcc ttc aaa gaa cgt aac ggt ggt aac cat gat ccg tct cgt				576
Thr Pro Ser Phe Lys Glu Arg Asn Gly Gly Asn His Asp Pro Ser Arg				
180	185	190		
atg aaa gct gtt atc tac tct aaa cat ttc tgg tct ggt cag gat aga				624
Met Lys Ala Val Ile Tyr Ser Lys His Phe Trp Ser Gly Gln Asp Arg				
195	200	205		
tct tct tct gct gat aaa cgt aaa tac ggt gat ccg gat gca ttc cgt				672
Ser Ser Ala Asp Lys Arg Lys Tyr Gly Asp Pro Asp Ala Phe Arg				
210	215	220		
ccg gct ccg ggt act ggt ctg gta gac atg tct cgt gat cgt aac atc				720
Pro Ala Pro Gly Thr Gly Leu Val Asp Met Ser Arg Asp Arg Asn Ile				

25	230	235	240	
cg cgt tct ccg act tct ccg ggt gaa ggc ttc gtt aac ttc gat tac				768
Pro Arg Ser Pro Thr Ser Pro Gly Glu Gly Phe Val Asn Phe Asp Tyr				
245	250	255		
gtt tgg ttc ggt gct cag act gaa gct gat gct gat aag act gta tgg				816
Trp Phe Gly Ala Gln Thr Glu Ala Asp Ala Asp Lys Thr Val Trp				
260	265	270		
acc cat ggt aac cat tac cat gct ccg aac ggt tct ctg ggt gct atg				864
Thr His Gly Asn His Tyr His Ala Pro Asn Gly Ser Leu Gly Ala Met				
275	280	285		
cat gta tac gaa tct aaa ttc cgt aac tgg tct gaa ggt tac tct gac				912
His Val Tyr Glu Ser Lys Phe Arg Asn Trp Ser Glu Gly Tyr Ser Asp				
290	295	300		
ttc gat cgt ggt gct tac gtt atc acc ttc att ccg aaa tct tgg aac				960
Phe Asp Arg Gly Ala Tyr Val Ile Thr Phe Ile Pro Lys Ser Trp Asn				
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act gct ccg gac aaa gtt aaa cag ggt tgg ccg				993
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325	330			
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Met Asp Ser Asp Asp Arg Val Thr Pro	1	5		
cca gct gaa cca ctg gat cgt atg cca gat cca tat cgt cca tct tat	161			
Pro Ala Glu Pro Leu Asp Arg Met Pro Asp Pro Tyr Arg Pro Ser Tyr				
10	15	20	25	
ggt cgt gct gaa act gtt gtt aat aat tat att cgt aaa tgg caa caa	209			
Gly Arg Ala Glu Thr Val Val Asn Asn Tyr Ile Arg Lys Trp Gln Gln				
30	35	40		
gtt tat tct cat cgt gat ggt cgt aaa caa caa atg act gaa gaa caa	257			
Val Tyr Ser His Arg Asp Gly Arg Lys Gln Gln Met Thr Glu Glu Gln				

45	50	55	
cgt gaa tgg ctg tct tat ggt tgc gtt ggt gtt act tgg gtt aac tct			305
Arg Glu Trp Leu Ser Tyr Gly Cys Val Gly Val Thr Trp Val Asn Ser			
60	65	70	
ggt cag tat ccg act aac cgt ctg gca ttc gct tcc ttc gat gaa gat			353
Gly Gln Tyr Pro Thr Asn Arg Leu Ala Phe Ala Ser Phe Asp Glu Asp			
75	80	85	
cgt ttc aag aac gaa ctg aag aac ggt cgt ccg cgt tct ggt gaa act			401
Arg Phe Lys Asn Glu Leu Lys Asn Gly Arg Pro Arg Ser Gly Glu Thr			
90	95	100	105
cgt gct gaa ttc gaa ggt cgt gtt gct aag gaa tcc ttc gat gaa gag			449
Arg Ala Glu Phe Glu Gly Arg Val Ala Lys Glu Ser Phe Asp Glu Glu			
110	115	120	
aaa ggc ttc cag cgt gct cgt gaa gtt gct tct gtt atg aac cgt gct			497
Lys Gly Phe Gln Arg Ala Arg Glu Val Ala Ser Val Met Asn Arg Ala			
125	130	135	
cta gag aac gct cat gat gaa tct gct tac ctg gat aac ctg aag aag			545
Leu Glu Asn Ala His Asp Glu Ser Ala Tyr Leu Asp Asn Leu Lys Lys			
140	145	150	
gaa ctg gct aac ggt aac gat gct ctg cgt aac gaa gat gct cgt tct			593
Glu Leu Ala Asn Gly Asn Asp Ala Leu Arg Asn Glu Asp Ala Arg Ser			
155	160	165	
ccg ttc tac tct gct ctg cgt aac act ccg tcc ttc aaa gaa cgt aac			641
Pro Phe Tyr Ser Ala Leu Arg Asn Thr Pro Ser Phe Lys Glu Arg Asn			
170	175	180	185
ggt ggt aac cat gat ccg tct cgt atg aaa gct gtt atc tac tct aaa			689
Gly Gly Asn His Asp Pro Ser Arg Met Lys Ala Val Ile Tyr Ser Lys			
190	195	200	
cat ttc tgg tct ggt cag gat aga tct tct tct gct gat aaa cgt aaa			737
His Phe Trp Ser Gly Gln Asp Arg Ser Ser Ala Asp Lys Arg Lys			
205	210	215	
tac ggt gat ccg gat gca ttc cgt ccg gct ccg ggt act ggt ctg gta			785
Tyr Gly Asp Pro Asp Ala Phe Arg Pro Ala Pro Gly Thr Gly Leu Val			
220	225	230	
gac atg tct cgt gat cgt aac atc ccg cgt tct ccg act tct ccg ggt			833
Asp Met Ser Arg Asp Arg Asn Ile Pro Arg Ser Pro Thr Ser Pro Gly			
235	240	245	
gaa ggc ttc gtt aac ttc gat tac ggt tgg ttc ggt gct cag act gaa			881
Glu Gly Phe Val Asn Phe Asp Tyr Gly Trp Phe Gly Ala Gln Thr Glu			
250	255	260	265
gct gat gct gat aag act gta tgg acc cat ggt aac cat tac cat gct			929
Ala Asp Ala Asp Lys Thr Val Trp Thr His Gly Asn His Tyr His Ala			

270

275

280

:cg aac ggt tct ctg ggt gct atg cat gta tac gaa tct aaa ttc cgt	977
'ro Asn Gly Ser Leu Gly Ala Met His Val Tyr Glu Ser Lys Phe Arg	
285 290 295	
:ac tgg tct gaa ggt tac tct gac ttc gat cgt ggt gct tac gtt atc	1025
'sn Trp Ser Glu Gly Tyr Ser Asp Phe Asp Arg Gly Ala Tyr Val Ile	
300 305 310	
:cc ttc att ccg aaa tct tgg aac act gct ccg gac aaa gtt aaa cag	1073
Fhr Phe Ile Pro Lys Ser Trp Asn Thr Ala Pro Asp Lys Val Lys Gln	
315 320 325	
ggg tgg ccg taatgaaaac ttggatctct aattactgga cttcacacag	1122
Gly Trp Pro	
330	
actaaaaatag acatatctta tattatgtga ttttgtgaca tttccttagat gtgaggtgga	1182
gggtatgtat aaggtagatg atgatccctct acggccggacg catcggtggcc ggcattacccg	1242
gcgcacacagg tgcgggttgct ggccctata tcgcccacat caccgatggg gaagatcgaa	1302
ctcgccactt cgggctcatg agcgcttggc tcggcgtggg tatgggtggca ggcccggtgg	1362
ccgggggact gttgggcccgc atctccttgc atgcaccatt cttgcggcg gcggtgctca	1422
acggccctcaa cctactactg ggctgcttcc taatgcagga gtcgcataag ggagagcgcc	1482
gagagccgc ctaatgagcg ggctttttt tcagctg	1519

<210> 4

<211> 39

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 4

aattcatcga ttagtaagga ggttaaaaat ggattctga

39

<210> 5

<211> 41

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 5

cgatcgtag aatccatttt aaacctcctt actaatcgat g

41

<210> 6
<211> 41
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 6
cgatcgtgtt actccaccag ctgaaccact ggatcgtatg c 41

<210> 7
<211> 41
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 7
gatctggcat acgatccagt ggttcagctg gtggagtaac a 41

<210> 8
<211> 41
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 8
cagatccata tcgtccatct tatggtcgtg ctgaaaactgt t 41

<210> 9
<211> 41
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 9
attaaacaaca gtttcagcac gaccataaga tggacgatat g 41

<210> 10
<211> 41
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 10
gttaataaatt atattcgtaa atggcaacaa gtttattctc a 41

<210> 11
<211> 41
<212> DNA
<213> Artificial Sequence

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<400> 11
tcacgatgag aataaacttg ttgccattta cgaatataat t 41

<210> 12
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<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 12
tcgtgatggc cgtaaacaac aaatgactga agaacaacgt g 41

<210> 13
<211> 41
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 13
gccattcacg ttgttcttca gtcatttgtt gtttacgacc a 41

<210> 14
<211> 42
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 14
aatggctgtc ttatggttgc gttggtgtta cttgggttaa ca 42

<210> 15
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<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 15
agcttgttaa cccaaagtaac accaacgcaa ccataagaca 40

<210> 16
<211> 38
<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 16
aattcgttaa ctctggtcag tatccgacta accgtctg 38

<210> 17
<211> 41
<212> DNA
<213> Artificial Sequence

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<400> 17
cgaatgccag acggtagtc ggataactgac cagagttaac g 41

<210> 18
<211> 49
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 18
gcattcgctt cttcgatga agatcgtttc aagaacgaac tgaagaacg 49

<210> 19
<211> 49
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 19
ggacgaccgt tcttcagttc gttcttgaaa cgatcttcat cgaaggaag 49

<210> 20

<211> 35
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 20
gtcgtccgat ttctggtgaa actcgtgctg aattc 35

<210> 21
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<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 21
gaccttcgaa ttcagcacga gtttcaccag aacgc 35

<210> 22
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<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 22
gaagggtcgtg ttgctaagga atccttcgat gaagagaaaag gcttccag 48

<210> 23
<211> 48
<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 23
gagcacgctg gaaggcatttc tcttcatcga aggattcctt agcaacac 48

<210> 24
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 24

cgtgctcgta aagttgcttc tgttatgaac cgtgctctag aa 42

<210> 25
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 25 agctttctag agcacggttc ataacagaag caacttcac 39

<210> 26
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 26 aattttctag agaacgctca tgatgaatct gcttacctgg ataac 45

<210> 27
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 27 cttcttcagg ttatccaggt aaggcagattc atcatgagcg ttctcttagag 50

<210> 28
<211> 49
<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 28 ctgaagaagg aactggctaa cggttaacgat gctctgcgtta acgaagatg 49

<210> 29
<211> 49
<212> DNA
<213> Artificial Sequence

220>
223> Description of Artificial Sequence:SYNTHETIC DNA
400> 29
agaacgagc atcttcgtta cgcaagcat cgttaccgtt agccagttc 49

<210> 30
<211> 40
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA
<400> 30
ctcggttctcc gttctactct gctctgcgtt acactccgtc 40

<210> 31
<211> 39
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA
<400> 31
ctttttttttttaaagga cggagtttta cgcaagcagc agtagaaacg 39

<210> 32
<211> 47
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA
<400> 32
cttcaaaagaa cgtttttttttaaagaa tccgtctcgtt atgaaag 47

<210> 33
<211> 47
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA
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gataaacagct ttccatatacgat acggatcatgtt tttttttttttaaagttt 47

<210> 34

<211> 45
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<210> 35
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<400> 35 agcttagatc tatcctgacc agaccagaaa tgtttagagt a 41

<210> 36
<211> 42
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<213> Artificial Sequence

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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 36 aatccagatc ttcttctgct gataaacgta aatacggta tc 42

<210> 37
<211> 44
<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 37 catccggatc accgtattta cgtttatcag cagaagaaga tctg 44

<210> 38
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<223> Description of Artificial Sequence:SYNTHETIC DNA

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<210> 40
<211> 35
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<210> 42
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ggtaaggct tcgttaactt cgattacggg tggttcggtg 40

<210> 43
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<212> DNA
<213> Artificial Sequence

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<400> 43
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<210> 44
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<212> DNA
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<400> 44
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<210> 45
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<210> 46
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<212> DNA
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<400> 46
aattcccatg gtaaccatta ccatgctccg aacggttct 39

<210> 47
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<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 47
caccaggaga accgttcgga gcatggtaat ggttaccatg gg 42

<210> 48

<211> 41
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<400> 48
ctgggtgcta tgcatgtata cgaatctaaa ttccgtaact g 41

<210> 49
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<212> DNA
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 49
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<210> 50
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<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 50
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<210> 51
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<212> DNA
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<400> 51
gtgataacgt aagcaccacg atcgaagtca gagtaac 37

<210> 52
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<400> 52

gttataccct tcattccgaa atcttggAAC actggtcc 38

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<210> 55
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<210> 56
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<212> DNA
<213> Artificial Sequence

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<400> 56
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<210> 57
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 57
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<210> 58
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<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 58
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<210> 59
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<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:SYNTHETIC DNA

<400> 59
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<210> 60
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<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:N-TERMINAL
FRAGMENT

<400> 60
Ser Asp Asp Arg Val
1 5

<210> 61
<211> 15
<212> DNA
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<220>
<223> Description of Artificial Sequence:CODON FOR
N-TERMINAL FRAGMENT

<400> 61
tctgacgatc gtgtt 15

<210> 62
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
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FRAGMENT

<400> 62
Met Ser Asp Asp Arg
1 5